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ABSTRACT

The purpose of this paper is to present a theoretical tradition which may broaden the scope and perhaps suggest alternate avenues of investigation of the function which we call "memory." As psychology developed during the past century, the area of memory has been strongly influenced on the theoretical level by the thinking of the British Associationists and on the experimental level by the work of Ebbinghaus. This influence has tended to overshadow other significant work and to narrow the approach to memory to those hypotheses and experiments which were consistent with or derived from the Associationist tradition. This paper will attempt to provide an overview of the Aristotelian tradition, with its basic theory and conceptual distinctions on the subject of memory. It is well known that Aristotle first proposed similarity and contiguity as memory clues. What is not so well known is that he also prposed a theory of memory which was integrated into his framework of psychological functions and ultimately into his theory of man. From this basis, selected representatives of the Aristotelian tradition will be presented. As might be anticipated, these representatives will be predominantly from the field of philosophy. (Author)

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Memory in Aristotle and Some Neo-Aristotelians

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The purpose of this paper is to present a theoretical tradition which may serve to broaden the scope and perhaps suggest alternate avenues of investigation of the function which we call "memory." As psychology developed during the past century, the area of memory was strongly influenced on the theoretical level by the thinking of the British Associationists and on the experimental level by the work of Ebbinghaus. This influence has tended to overshadow other significant work and to narrow the approach to memory to those hypotheses and experiments which were consistent with or derived from the Associationist tradition. The recent challenge to "associationism" by "contextualism" [1] appears to be a healthy move, but it is insufficient to account for the complexities of memory and it illustrates a prevailing weakness in modern psychology, viz., a lack of historical perspective as well as an inadequate model and conceptual frame of reference.

This paper will attempt to provide an overview of Aristotle's theoretical model, his conceptual tools and basic distinctions on the subject of memory. It is well known that he first proposed similarity, contrariety, and contiguity as memory clues. What is not so well known is that he also proposed a theory of memory which was integrated into his framework of psychological functions and ultimately into his theory of man. I have not attempted to follow the refinements and variations of Aristotle's theory through the centuries of Greek, Arabian, and Scholastic traditions. Rather, I have moved directly from Aristotle's work to the twentieth century and have selected two scholars who have used the Aristotelian model to integrate and evaluate modern work in psychology and neurology.

Aristotle's discussion of memory is related to and embedded in a broad

framework which includes not only man but all animate beings. The object of psychology as Aristotle views it is to discover the nature and essence of the soul and its attributes.[2] His investigation therefore covers the entire range of animate beings on the phylogenetic scale, from those manifesting minimal nutritive functions to those manifesting maximal rational functions. Soul is common to all, though the level of functioning varies according to the nature of the organism.

After giving a rather obscure definition of soul as ". . . the first actuality of a natural body that potentially has life,"[3] Aristotle goes on to describe the organism in terms of his hylomorphic principles. Every living being is a composite unit possessing both matter and form, body being the matter and soul being the form. The originality and importance of this theory lie in the concept of the organism as a single complex whole. Soul is not a separate entity which merely inhabits the body during the lifetime of the organism. It is the actuality of the body, that which makes a living being to be alive. The term "actuality" in Greek is enteleichia, which has more dynamic implications than the translation implies. I read the passage cited above to state that every organism, including the human, develops and functions on the basis of an innate "blue-print" or plan or law which dictates what the organism needs for existence and for optimal growth. A plant, for example, needs certain biochemical combinations of earth, sun, air, and water. As one moves up the phylogenetic scale the needs become more complex as the organism becomes more complex, but on each level one finds an operative law on basis of which the organism grows and functions.

Having established the meaning of the term "soul," Aristotle goes on to identify its various faculties or powers. These clearly are not parts in the sense of separate entities but rather modalities of functioning. Reification

of these modalities is largely an artifact of language in the sense that the modality by which or through which an organism functions is spoken of as that which functions. Failure to note this disctinction has led to repeated distortion of Aristotle's faculty psychology and ultimately has led to the disrepute of all faculty psychology.

Before discussing the faculties in detail, Aristotle presents in summary form the six major faculties in ascending order of complexity and level of functioning (De Anima II, III 414a 29 -- 414b 19). All living beings have the ability to nourish themselves as well as to grow and reproduce themselves. Thus the nutritive faculty (threptikon) is common to all living beings and is that characteristic by which an organism is distinguished from non-living matter. This is the only functional modality possessed by plants, whereas animals have at least one other modality, viz., sensation (aisthētikon). This faculty includes the five senses of touch, taste, hearing, smell, and sight, although not all animals possess all five senses. The next three faculties are desire (erektikon), locomotion (kinētikon kata topon), and imagination (phantasia). The last of the six faculties, and the highest in terms of functioning, is reason (nous). Imagination, "the process by which we say that an image is presented to us,"[4] is clearly differentiated from sensation on basis both of absence of the object and lapse of time. After a lengthy analytic process Aristotle concludes that "imagination must be a movement produced by sensation actively operating."[5] Since sight is the chief sense, he reasons, the name "phantasia" is derived from "phaos" or light, because without light it is impossible to see.

In discussing the origin of movement Aristotle points out the close connection of locomotion with desire as well as with reason and imagination. Although he does not admit that animals have reason in the strict sense, many

of them have imagination, the ability to form mental images, and he concedes that imagination is some sort of "thinking process."[6] He concludes this analysis by saying:

> Speaking generally then, as has been said, in so far as the living creature is capable of appetite, it is also capable of self movement; but it is not capable of appetite without imagination, and all imagination involves either calculation or sensation. This latter all other living creatures share besides man.[7]

In summary, imagination derives from sensation, but unlike sensation itself it may be true or false. As related to memory imagination has the important function of serving as the basis of memory because memory does not take place without mental images.

This outline of Aristotle's psychology is quite rudimentary but it should serve to provide a context for his discussion of memory and remembering. As I indicated above in passing, he considers the time factor to be of major importance in the function of imagination and therefore of memory. He says:

> It is impossible to remember the future, which is an object of conjecture or expectation . . . nor is there memory of the present, but only perception, for it is neither the future nor the past that we cognize by perception, but only the present. But memory is of the past; no one would claim to remember the present while it is present.[8]

Memory, then, is distinct from the faculty of sensation in that it has to do specifically with the past. It involves imagination in that "it is impossible even to think without a mental picture."[9] It is therefore a function of that faculty of the soul to which imagination belongs, viz., the primary sense-faculty or <u>sensus communis</u>. The reason given is that it is found not only in man who is capable of thought but in some animals as well. As to the question of how one can remember something which is not present, Aristotle proposes an "affection" which is produced by sensation and is a lasting state like a picture. He says: "For the stimulus produced impresses a sort of likeness of the percept, just as when men seal with signet rings."[10]

Aristotle then raises the question of whether one remembers the present "affection" or the original from which it came. He argues that memory is of the original. How this can be is explained by analogy:

> Just as the picture painted on the panel is at once a picture and a portrait, and though one and the same, is both, yet the essence of the two is not the same, and it is possible to think of it both as a picture and as a portrait, so in the same way we must regard the mental picture within us both as an object of contemplation in itself and as a mental picture of something else.[11]

In other words, in being aware of an image it is possible to be aware of it as the image <u>of</u> something and of something <u>past</u>. When these two conditions are fulfilled we have not mere imagination but the more complex act called memory.

After his discussion of memory Aristotle proceeds to consider recollection, a function which is distinguished both from continuous actual memory and from relearning what has been forgotten. Recollection is the actualizing of memory, i. e., of an image which has disappeared from consciousness. The principle on which recollection operates is that movements left in our organs by perceptions tend to succeed each other in regular order.[12] Association of ideas occurs by similarity, by contrariety, or by contiguity,[13] i. e., the recollection of an object tends to occur on basis of what is like it or contrary to it or contiguous to it in the original experience. This principle which operates in spontaneous recollection is the guide to be adopted in deliberate or voluntary recollection. The ease or difficulty in recollecting depends largely on the starting point and on the degree of order in arrangement of the memory traces. Aristotle states:

> Thus, when a man wishes to recall anything, this will be his method: he will try to find a starting point for an impulse which will lead to the one he wants. This is why acts of recollection are achieved soonest and most successfully when they start from the beginning of a series; for just as the objects are related to each other in an order of succession, so are the impulses. Those subjects which possess an orderly arrangement, like mathematical problems, are the easiest to recollect; ill-arranged subjects are recovered with difficulty.[14]

In this brief overview of Aristotle's theory of memory and recollection I have attempted to follow the original text as closely as possible, despite the fact that the language is somewhat alien to modern ears. It is evident that Aristotle's theory includes far more than the principles of recollection for which he is best known in modern times. It is interesting that he does not consider memory or recollection as a distinct faculty. Memory is an "affection" (pathos), what we would call an engram. Recollection, the actualizing of the memory trace, seems to be a function of the faculty by which we perceive time, viz., the sensus communis, although Aristotle notes that the faculty of reason is involved when recollection entails any kind of inference.[15] It is on basis of this latter factor that he makes a further distinction between remembering, common to certain animals and to man, and recollecting, unique to man.

Aristotle's psychology has survived in modified form in the Scholastic tradition of philosophical psychology. Rather than review this tradition in its current form on the general subject of memory, I have selected two scholars with widely divergent backgrounds whose writings reflect the influence of Aristotle and whose modifications of his categories illustrate what can be done with a basically valid frame of reference. The first of these writers, a man by the name of Hermann Gruender, is closer to the general Scholastic tradition. Gruender's little-known work--indeed he is cited in none of the standard histories of psychology--is an example of scholastic faculty psychology in the Aristotelian tradition integrated with modern experimental psychology.

According to Gruender, "memory proper may be defined as the power which we have to retain, recall, and recognize the contents of past experience."[16] Retention is understood as "potential recall," comparable to Aristotle's view of memory. At this point Gruender distinguishes sensory from intellectual memory and attributes the retention of only sensory experience to physiological

traces or engrams. Rejecting Aristotle's position on this point he says:

> An experimentalist may abstain from the philosophical considerations to which the careful analysis of these facts lead. But one thing he cannot do: he cannot say with even a semblance of truth that he has explained the potential recall of our intellectual experiences simply in terms of neural grooves.[17]

Although Gruender disclaims any philosophical bias, one begins to suspect the same in view of the fact that he has no plausible explanation for retention of concepts.

For Gruender recall is considered the actual revival of the content of past experience, much the same as Aristotle's "recollection." Gruender, however, makes a distinction between recall and recognition and proposes that the mere revival of a past experience does not constitute recognition. What he is referring to is the function of memory in conjunction with a present repeated experience. Thus, if an object is absent and one revives the memory of it, it is recalled. If an object is present and one revives the memory of it, it is recognized. Although this appears to be knit-picking, it is a valid distinction and may be taken as a refinement of Aristotle's basic theory. In such cases of recognition what makes the revival of a past experience an act of memory is the knowledge that one has experienced the present object or situation before. Gruender is dealing, obviously, with the conscious level of functioning. Had he pursued this issue in the direction of the Eigenwelt, or self-world,[18] he could have added a whole new dimension to the phenomenon of memory insofar as it affects perception on the unconscious level.

Responding to issues current in his time, Gruender discusses the "temporal sign" and "local sign" theories of memory. He admits that every recognition involves some localization in time or in place but he denies that either is an essential component of memory proper. He then discusses other aspects of memory, adding distinctions and refinements characteristic of the scholastic

tradition. He speaks of sensory memory, logical memory, rote memory, and mechanical memory. His discussion of the latter is the closest he comes to a consideration of the unconscious aspect of memory. He views mechanical memory in terms of neuromuscular habits such as those utilized by the pianist, the typist, or the telegrapher. His approach is essentially on the motor level, although he recognizes that there are several heterogeneous learning processes involved on the sensory and intellectual levels of functioning. In brief, Gruender reflects the traditional scholastic approach, with certain refinements and modifications of the basic Aristotelian theory of memory. In addition to the distinction noted above between sensory and intellectual memory, the treatment of memory as a distinct faculty instead of a derivative of imagination and a function of the sensus communis.

The second scholar whose work I have selected as reflecting the influence of Aristotle is Magda B. Arnold. Memory is discussed only in passing in her comprehensive work on emotion and personality but her use of the Aristotelian frame of reference to organize and integrate findings of modern psychology and neurophysiology illustrates what can be done with a basically valid theory when it can be modified and extended by material unknown to Aristotle himself. In her discussion of appraisal and its relationship to memory Arnold says:

> Among psychologists, it has usually been held that memory (and therefore learning) is a unitary function mediated by the brain as a whole ("mass action"; cf. Lashley, 1929, 1950). But the evidence that has accumulated in recent years seems to suggest, rather, that the sense impressions in each modality are registered separately. Hence memory is not a unitary function. It includes visual memory, mediated by the visual association cortex, somesthetic memory mediated by the somesthetic association area, and auditory, olfactory, gustatory, and motor memory mediated by their respective association areas. Nielsen (1956), among other neurologists, has held this view for years.[19]

After discussing the memory traces and their location, Arnold takes up the issue of their activation. Here she distinguishes between recognition and recall. Recognition is taken as ". . . a feeling of familiarity when we see or hear

something we have seen or heard before,"[20] whereas "Recall seems to bring back relevant memory images and do so in the original order."[21] On basis of recent research, Arnold argues for a difference in the cortical areas utilized in recognition and recall. Recognition seems to be mediated by the secondary sensory areas. She says:

> To recognize something as, for instance, having seen it before seems to imply that the secondary sensory area has been activated more than once in the same way. The second time this particular neural pattern arrives in the primary visual area (Brodmann area 17), it will mediate, as before, the experience of 'seeing this thing'; but the second time the pattern arrives in the secondary area (area 18), it seems to give rise to the experience of 'having seen this before.'[22]

Arnold uses the same distinction as Gruender but goes much further in that she substantiates the hypothesis in terms of neurological findings rather than simply on basis of reasoning.

Similarly with the function of recall Arnold presents a more detailed and highly sophisticated analysis. In agreement with Aristotle but not with Gruender, Arnold maintains that "to recall anything at all, we must produce a visual, auditory, or other image of it."[23] Recall may be spontaneous or deliberate but it is always selective. Given the essential components of recall as the activation of images in the original order, Arnold argues:

> To recall memories in the right order, there must be a circuit from cortical and limbic sensory areas that connects with the thalamic sensory nuclei in such a way that it accompanies the visual or other sensory projection back to the sensory projection area. To recall relevant memories, this circuit must connect with a cortical structure that allows selective activation of memory engrams. The hippocampus is a primitive type of cortex and has the necessary connections from sensory and limbic cortex (see Ch. 2) that would make it possible to relay sensory impulses (after perception and appraisal) to midbrain and thalamic nuclei.[24]

Arnold then proceeds to review pertinent neurological research and shows that the major findings are not only consistent with the suggested memory circuit but also, as far as they go, substantiate her hypothesis. She notes that the hypothesis holds regardless of what the engram or the mechanism of registration may

turn out to be.[25]

Given the activation of memory traces through recall, the question arises as to the relationship between recall and imagination. As noted above, Aristotle viewed recall or recollection as somehow secondary to imagination. Not so says Arnold, with a wealth of neurological data to back her position. Whereas recall involves activation of memory traces in their original order, imagination involves activation of traces in a new and different order or combination. To account for the various characteristics of imagination Arnold postulates a different system, viz., the amygdaloid complex, which has the connections required to mediate imagination.[26] Recall and imagination are related, as Aristotle observed, in that both use the sensory and motor images that remain after every perception and action. They are different on basis of their characteristic use of these images as well as on basis of the different systems or neurological circuits mediating the activation of these images.

A further refinement of the concept of memory is made by Arnold in her proposal of "affective memory."[27] She relates this to the estimative sense, that by which we evaluate everything that is experienced as good, bad, or indifferent. She says:

> Each intuitive estimate seems to be preserved as a disposition to be activated. We could call this an "affective memory" provided we realize that we newly experience the emotions produced by the revived original estimate, we do not remember them.[28]

To illustrate affective memory she uses the example of a person who is afraid every time he has a dentist's appointment. The original appraisal, perhaps long forgotten, is revived every time the person sits down in the dentist's chair and produces intense fear. As to the system mediating appraisal and affective memory, Arnold proposes the limbic cortex bordering on the primary sensory and motor areas and on the secondary association areas.[29]

In summary, it may be useful for us to compare the observations and

reasoning in Aristotle, the first systematizer of memory, with the modifications and refinements in Gruender and Arnold. Aristotle in many respects may be outdated and outmoded, but his work stands as an example as well as a reminder of the need for a broad, systematic frame of reference within which organize, integrate, and evaluate material from various areas of research. I do not know whether Arnold will accept the label "Neo-Aristotelian," but I feel that if Aristotle is to have any relevance today in the biological and behavioral sciences that relevance will come from the use of his categories and broad frame of reference in a manner similar to what Arnold has done.

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